



Advancing Sustainability with INVEST: Focus on Pavements

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Federal Highway Administration

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Arizona Pavements/Materials Conference



Today's Agenda



1. Overview of INVEST
2. What's New In Version 1.2
3. INVEST and Pavements - Criteria
Examples and Case Studies
4. New INVEST Opportunities



Overview



What is Sustainability?



The Sustainability Triple Bottom Line

What is a Sustainable Highway System?



- Integral part of sustainable development
- Satisfies functional requirements
 - › Fulfills transportation goals and needs
- Addresses development and economic growth
- Avoids, minimizes, reduces impacts
 - › Environment
 - › Consumption of resources

What is INVEST?



INVEST - Infrastructure Voluntary Evaluation Sustainability Tool

A web-based self-evaluation tool for assessing sustainability over the life cycle of a transportation project or program — from system and project planning through design and construction, to operations and maintenance



The Sustainability Triple Bottom Line

Why Use INVEST?



- Demonstrate achievements on outcomes your stakeholders care about
- Benchmark for continuous improvement
- Save time – use existing, objective and comprehensive framework
- Save money by identifying practices that reduce costs
- Facilitate communication



INVEST is the only tool that meets all of the following:

- Specific to transportation
- Covers full life-cycle
- Self-evaluation, no third party certification
- Free

- Released in September 2015
- Changes include website enhancements and improvements in functionality
- **System Planning Module for States and Regions** – separate scorecards and scoring requirements better align with type of user and their activities
- **Criteria Changes** - additions, deletions, modifications in all modules
- **Innovative Criteria** – may be added for sustainable innovations and emerging technologies

- **New PD Scorecard** – Recreational and Scenic Projects
- **Website Enhancements** - tool resources and updates to make the tool better
- **Information Reorganized**
- Version 1.2 for all new evaluations
- Version 1.1 evaluations – may be retained and converted to Version 1.2

INVEST Home Page



Version 1.2

Login

[Register](#)



About

Learn

Criteria

Score

Resources

Download and explore the INVEST Version 1.2 User Toolkit, Application Guide, and Compendia.

Popular Links

Case Studies

Videos

INVEST Library

Getting to Know INVEST

My Workspace

FHWA Sustainable Highways Initiative

Version 1.2 Translation

Who is using INVEST?

System Planning for States



System Planning for Regions



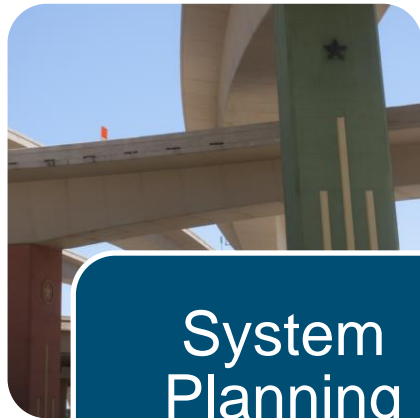
Project Development



Operations and Maintenance



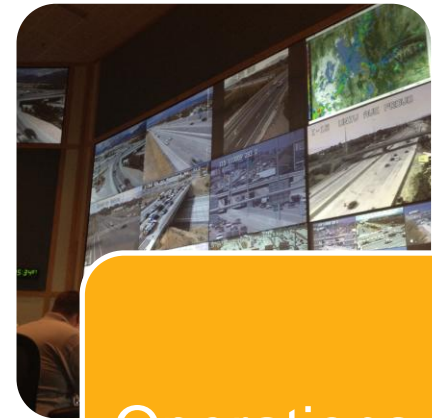
Supporting the Entire Life Cycle



System
Planning
(State or
Regional) &
Processes



Project
Development
Planning
Design
Construction



Operations &
Maintenance

System Planning for States Criteria



SPS-1	Integrated Planning: Economic Development and Land Use	SPS-9	Travel Demand Management
SPS-2	Integrated Planning: Natural Environment	SPS-10	Air Quality and Emissions
SPS-3	Integrated Planning: Social	SPS-11	Energy and Fuels
SPS-4	Integrated Planning: Bonus	SPS-12	Financial Sustainability
SPS-5	Access and Affordability	SPS-13	Analysis Methods
SPS-6	Safety Planning	SPS-14	Transportation Systems Management and Operations
SPS-7	Multimodal Transportation and Public Health	SPS-15	Linking Asset Management and Planning
SPS-8	Freight and Goods Access and Mobility	SPS-16	Infrastructure Resiliency
		SPS-17	Linking Planning and NEPA

System Planning for Regions Criteria



SPR-1	Integrated Planning: Economic Development and Land Use	SPR-9	Travel Demand Management
SPR-2	Integrated Planning: Natural Environment	SPR-10	Air Quality and Emissions
SPR-3	Integrated Planning: Social	SPR-11	Energy and Fuels
SPR-4	Integrated Planning: Bonus	SPR-12	Financial Sustainability
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SPR-6	Safety Planning	SPR-14	Transportation Systems Management and Operations
SPR-7	Multimodal Transportation and Public Health	SPR-15	Linking Asset Management and Planning
SPR-8	Freight and Goods Access and Mobility	SPR-16	Infrastructure Resiliency
		SPR-17	Linking Planning and NEPA

Project Development Criteria



PD-1 Economic Analyses

PD-10 Pedestrian Facilities

PD-2 Lifecycle Cost Analyses

PD-11 Bicycle Facilities

PD-3 Context Sensitive Project Development

PD-12 Transit and HOV Facilities

PD-13 Freight Mobility

PD-4 Highway and Traffic Safety

PD-14 ITS for System Operations

PD-5 Educational Outreach

PD-15 Historical, Archaeological, and Cultural Preservation

PD-6 Tracking Environmental Commitments

PD-16 Scenic, Natural, or Recreational Qualities

PD-7 Habitat Restoration

PD-8 Stormwater Quality and Flow Control

PD-17 Energy Efficiency

PD-9 Ecological Connectivity

PD-18 Site Vegetation, Maintenance, and Irrigation

More Project Development Criteria



PD-19	Reduce, Reuse, and Repurpose Materials	PD-27	Construction Noise Mitigation
PD-20	Recycle Materials	PD-28	Construction Quality Control Plan
PD-21	Earthwork Balance	PD-29	Construction Waste Management
PD-22	Long-Life Pavement Design	PD-30	Low Impact Development
PD-23	Reduced Energy and Emissions in Pavement Materials	PD-31	Infrastructure Resiliency Planning and Design
PD-24	Permeable Pavement	PD-32	Light Pollution
PD-25	Construction Environmental Training	PD-33	Noise Abatement
PD-26	Construction Equipment Emission Reduction		

Operations & Maintenance Criteria



OM-1	Internal Sustainability Plan	OM-8	Bridge Management System
OM-2	Electrical Energy Efficiency and Use	OM-9	Maintenance Management System
OM-3	Vehicle Fuel Efficiency and Use	OM-10	Highway Infrastructure Preservation and Maintenance
OM-4	Reduce, Reuse, and Recycle	OM-11	Traffic Control Infrastructure Maintenance
OM-5	Safety Management	OM-12	Road Weather Management Program
OM-6	Environmental Commitments Tracking System	OM-13	Transportation Management and Operations
OM-7	Pavement Management System	OM-14	Work Zone Traffic Control

How INVEST Measures Sustainability



[My Workspace](#) Logged In as FHWA Demos

Logout
Version 1.0

[Home](#) [Learn](#) [Browse](#) [Score](#) [Home > Score > Scorecard](#)

[go](#)

System Planning Scorecard

Program or Process: Test 1 [edit](#)

[View full scorecard](#) to save or print from your browser.

Criteria	Points
SP-01 Integrated Planning: Economic Development and Land Use 15/15 Integrate statewide and metropolitan Long Range Transportation Plans (LRTP) with statewide, regional, and/or local land use plans and economic development forecasts and goals. Proactively encourage...	
SP-02 Integrated Planning: Natural Environment 15/15 Integrate ecological considerations into the transportation planning process, including the development of the long range transportation plan (LRTP) and TIP/STIP. Proactively support and enhance...	
SP-03 Integrated Planning: Social 15/15 The agency's Long Range Transportation Plan (LRTP) is consistent with and supportive of the community's vision and goals. When considered in an integrated fashion, these plans, goals and visions...	

Download

[Compendium - Web Version](#)

[Compendium - Print Version](#)

[Scorecard](#)

Score

79

Your Rating: Bronze

96 points needed for Silver

120 points needed for Gold

144 points needed for Platinum

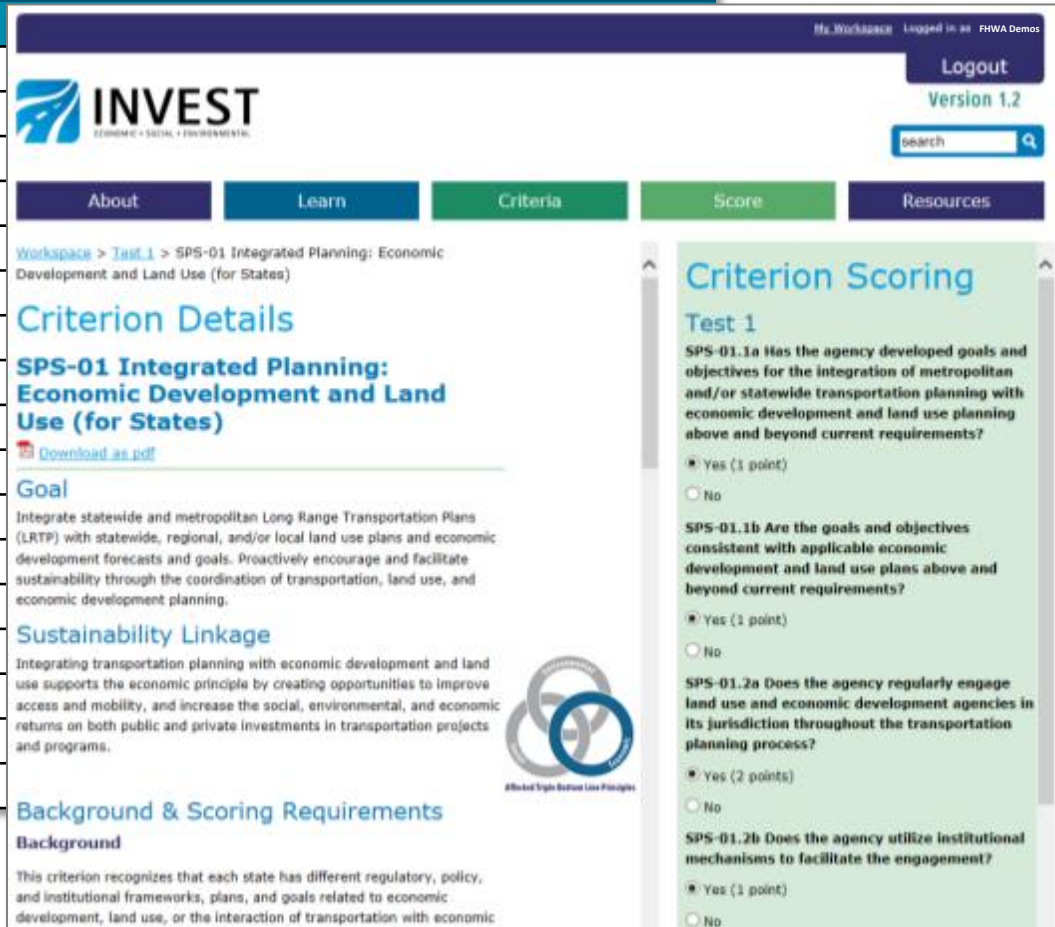
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Scoring in INVEST

System Planning for States Criteria by Sustainability Principle

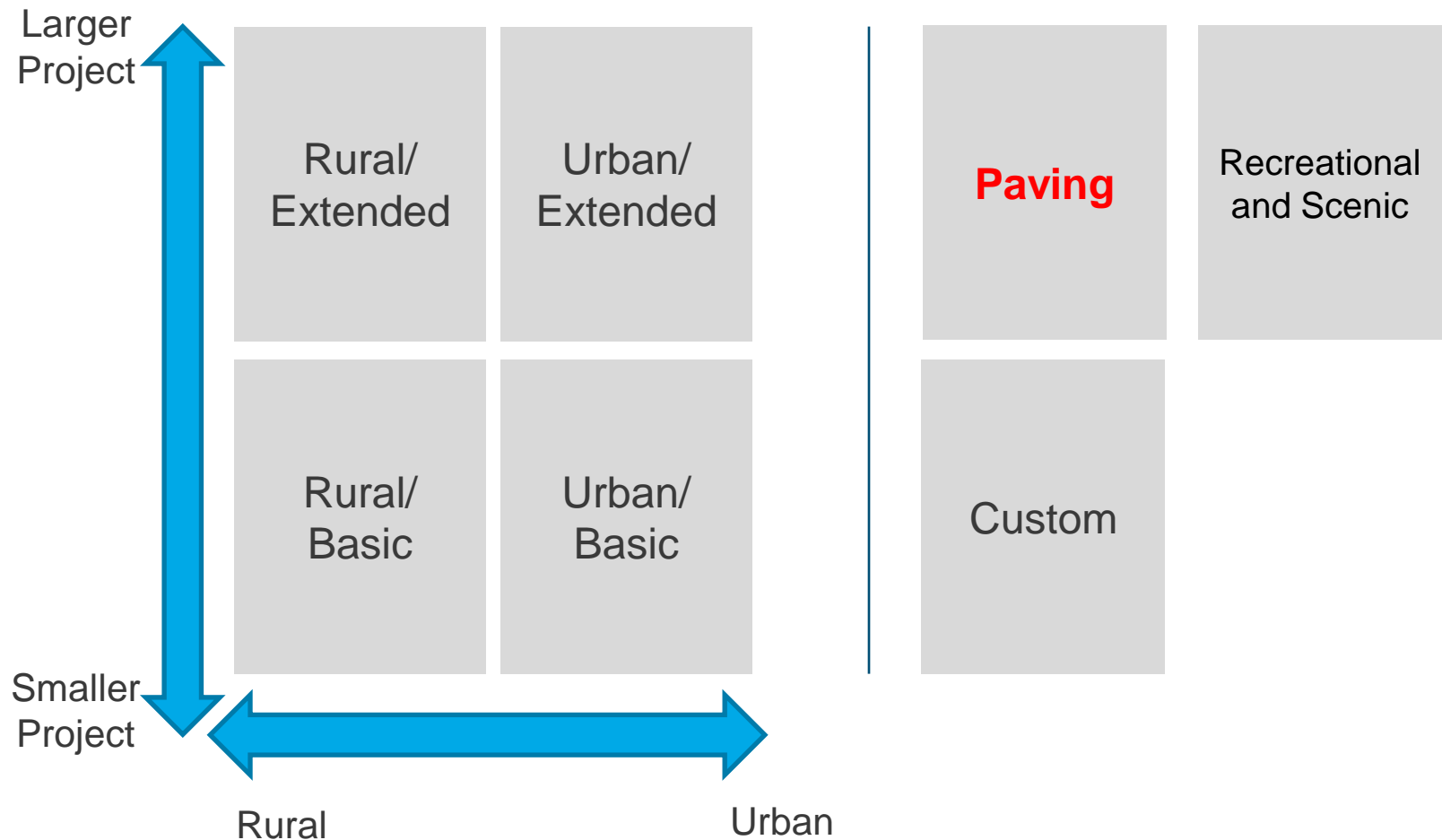
Criterion Number and Title

SPS-01: Integrated Planning: Economic Development and Land Use
SPS-02: Integrated Planning: Natural Environment
SPS-03: Integrated Planning: Social
SPS-04: Integrated Planning: Bonus
SPS-05: Access and Affordability
SPS-06: Safety Planning
SPS-07: Multimodal Transportation and Public Health
SPS-08: Freight and Goods Access & Mobility
SPS-09: Travel Demand Management
SPS-10: Air Quality & Emissions
SPS-11: Energy and Fuels
SPS-12: Financial Sustainability
SPS-13: Analysis Methods
SPS-14: Transportation Systems Management and Operations
SPS-15: Linking Asset Management and Planning
SPS-16: Infrastructure Resiliency
SPS-17: Linking Planning and NEPA



The screenshot displays the INVEST web application interface. At the top, there's a navigation bar with 'My Workspace', 'Logged in as PHWA Demo', and a 'Logout' button. Below this is the 'INVEST' logo and a search bar. The main navigation menu includes 'About', 'Learn', 'Criteria', 'Score', and 'Resources'. The 'Criteria' section is active, showing 'Workspace > Test 1 > SPS-01 Integrated Planning: Economic Development and Land Use (for States)'. The 'Criterion Details' section for 'SPS-01 Integrated Planning: Economic Development and Land Use (for States)' is displayed, including a 'Download as pdf' link. The 'Goal' section states: 'Integrate statewide and metropolitan Long Range Transportation Plans (LRTP) with statewide, regional, and/or local land use plans and economic development forecasts and goals. Proactively encourage and facilitate sustainability through the coordination of transportation, land use, and economic development planning.' The 'Sustainability Linkage' section states: 'Integrating transportation planning with economic development and land use supports the economic principle by creating opportunities to improve access and mobility, and increase the social, environmental, and economic returns on both public and private investments in transportation projects and programs.' The 'Background & Scoring Requirements' section includes a 'Background' paragraph: 'This criterion recognizes that each state has different regulatory, policy, and institutional frameworks, plans, and goals related to economic development, land use, or the interaction of transportation with economic'. The 'Criterion Scoring' section for 'Test 1' shows three questions with radio button options for 'Yes' and 'No':
 SPS-01.1a Has the agency developed goals and objectives for the integration of metropolitan and/or statewide transportation planning with economic development and land use planning above and beyond current requirements?
☒ Yes (1 point)
☐ No
 SPS-01.1b Are the goals and objectives consistent with applicable economic development and land use plans above and beyond current requirements?
☒ Yes (1 point)
☐ No
 SPS-01.2a Does the agency regularly engage land use and economic development agencies in its jurisdiction throughout the transportation planning process?
☒ Yes (2 points)
☐ No
 SPS-01.2b Does the agency utilize institutional mechanisms to facilitate the engagement?
☒ Yes (1 point)
☐ No

Multiple Scorecards to Fit Your Project



Achievement Levels

Achievement level	
	Platinum
	Gold
	Silver
	Bronze

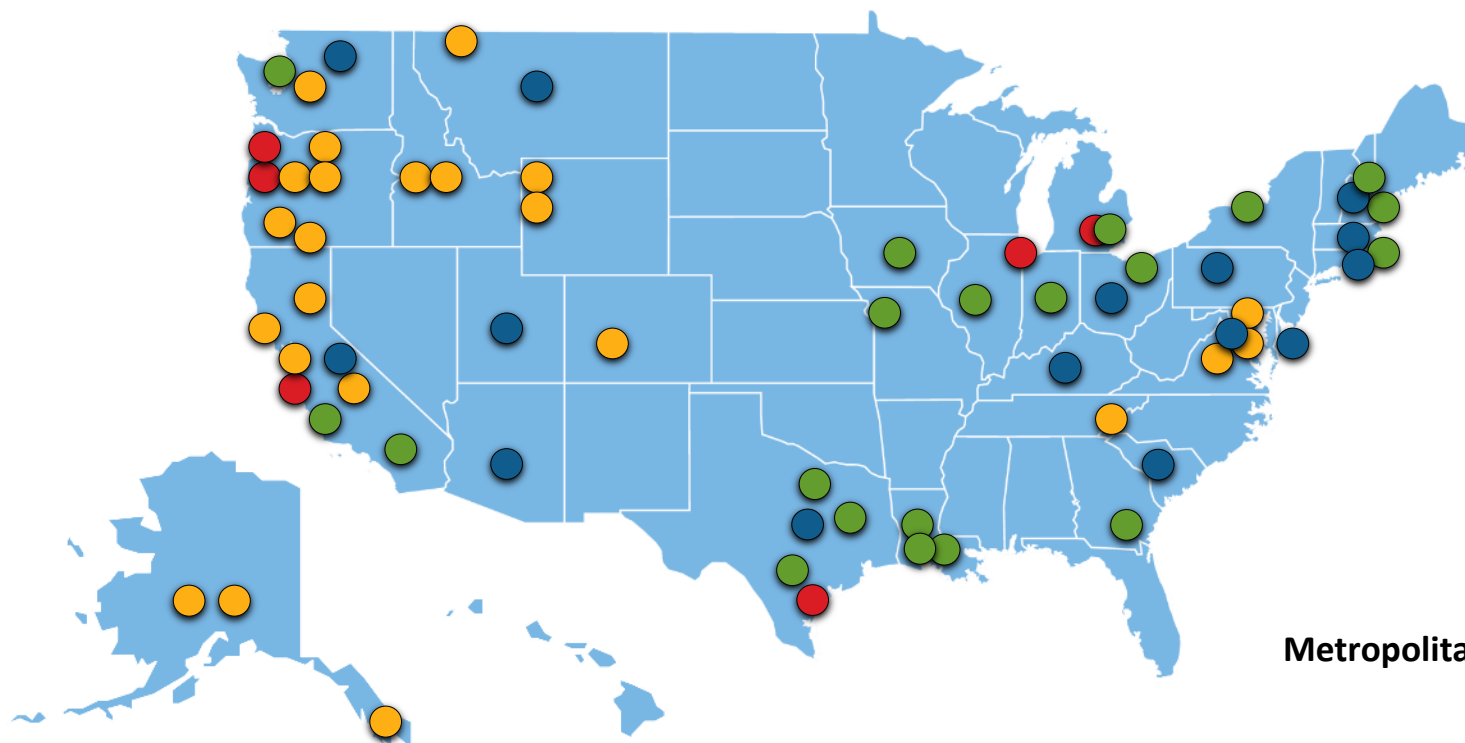
INVEST Usage



INVEST Usage By the Numbers

Entities that have informed
FHWA they are using INVEST:

- 15 State DOTs
- 20 MPOs
- 23 Federal Lands Units
- 6 other transport agencies
in US (local, transit, tollway)
- 1 foreign government



State DOT ●
Metropolitan Planning Org. (MPO) ●
Federal Lands Unit ●
Other ●



Pavement Life Cycle and INVEST



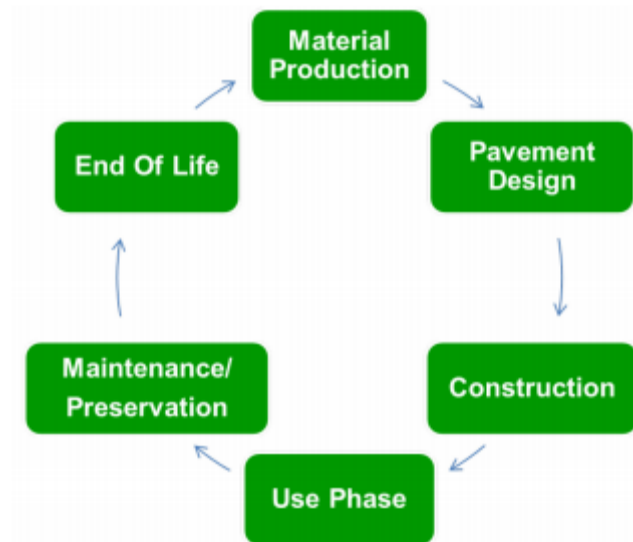
Pavement Life Cycle and INVEST



Material Production	Pavement Design	Construction	Use Phase	Maintenance/ Preservation	End of Life
PD-19	PD-02	PD-24	PD-33	OM-10	PD-19
PD-20	PD-22	PD-33	OM-07		
PD-23		OM-07			

Other Pertinent Criteria

OM-04



PD-19 Reduce, Reuse and Repurpose Materials

- **Goal:** Reduce lifecycle impacts from extraction and production of virgin materials by recycling materials.
- **Sustainability Linkage:** Reducing and reusing materials supports the environmental and economic principles of the triple bottom line by reducing the consumption of raw materials, reducing landfill waste, and encouraging cost savings.
- **Total Points Available: 12**



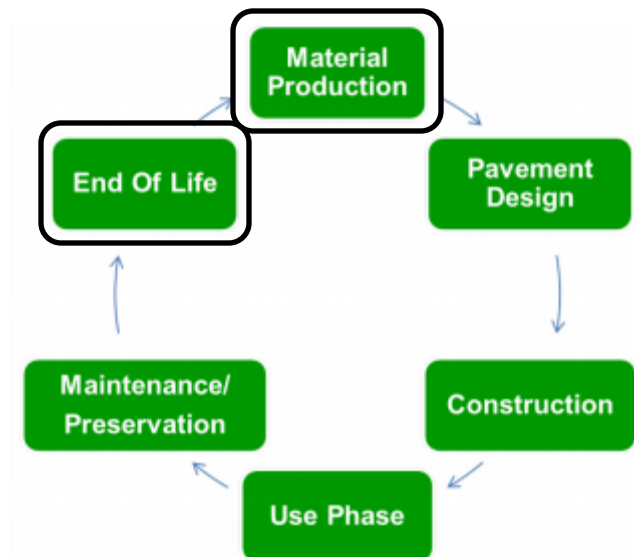
PD-19 Reduce, Reuse and Repurpose Materials

- **Relevance:**

Requirements PD-19.1, PD-19.2, PD-19.5, and PD-19.6b (up to 12 points)

- **Example: Western Federal Lands**

- WFL assessed the North Park Road, Jackson Lake Lodge to Leek's Marina Project along Highway 89 in Grand Teton National Park, WY.
- Reuse of every piece of rock and reuse of pavement to limit the need for new materials.



PD-02 Lifecycle Cost Analyses

- **Goal:** Reduce life-cycle costs and resource consumption through the informed use of life-cycle cost analyses of key project features during the decision-making process for the project.
- **Sustainability Linkage:** Conducting a life-cycle cost analysis supports the environmental and economic principles by promoting efficient use of materials and resources.
- **Total Points Available: 3**



Affected Triple Bottom Line Principles

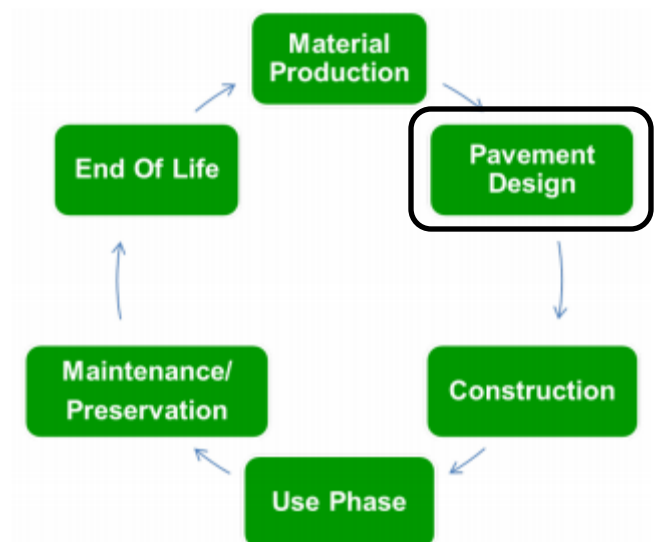
PD-02 Lifecycle Cost Analyses

- **Relevance:**

Requirement PD-02.1a: Perform LCCA for Pavement Structures Alternatives (1 point)

- **Example: Illinois Tollway**

- Applied INVEST to individual projects to generate a snapshot of sustainability, at various points in Tollway history.
- Typically performs an LCCA on pavement section alternatives.



PD-33 Noise Abatement

- **Goal:** Reduce traffic noise impacts to surrounding communities and environments.
- **Sustainability Linkage:** The reduction of noise benefits both the human and natural environment. Therefore, this criterion supports the environmental and social principles of the triple bottom line.
- **Total Points Available: 5**



Affected Triple Bottom Line Principles

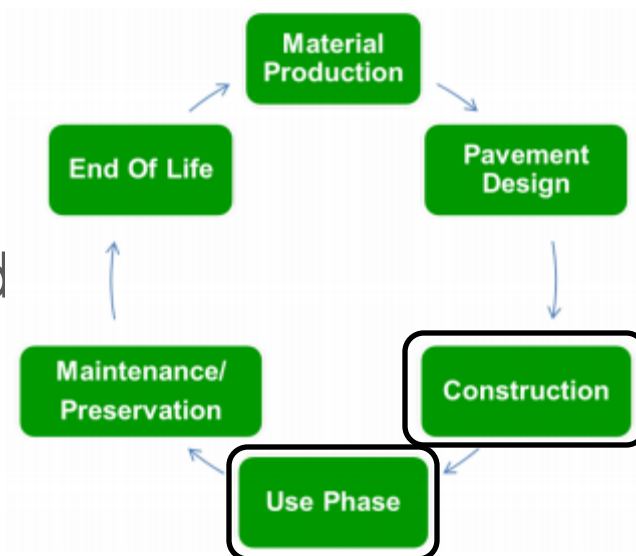
PD-33 Noise Abatement

- **Relevance:**

Requirement PD-33.4: Design Quiet Pavements
(up to 3 points)

- **Example: Arizona DOT (ADOT)**

- Quiet Pavement Pilot Program
- Noise readings show that rubberized asphalt generally reduces tire noise by an average of 4 decibels.
- Approximately 1,500 tires are used for every lane-mile of rubberized paving.



OM-10 Highway Infrastructure Preservation and Maintenance



- **Goal:** Reduce traffic noise impacts to surrounding communities and environments.
- **Sustainability Linkage:** Infrastructure preservation and maintenance activities supports all of the triple bottom line principles by better leveraging funds, improving system quality and customer satisfaction and more effectively maintaining assets, which reduces cost and the environmental impacts of construction and raw material use.
- **Total Points Available: 15**



OM-10 Highway Infrastructure Preservation and Maintenance

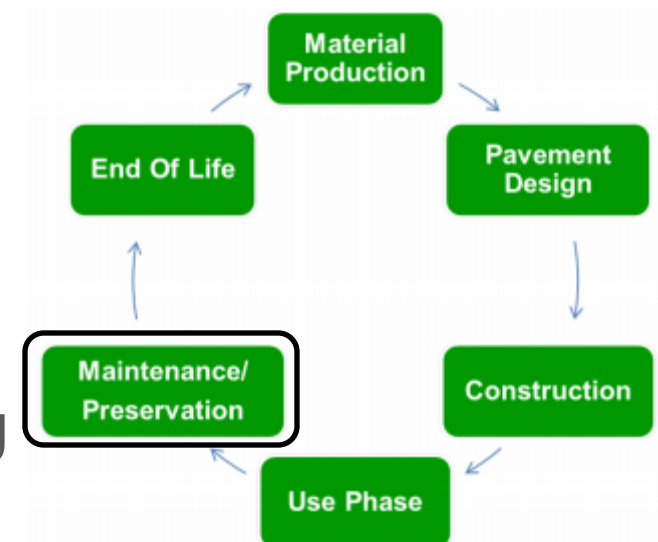


- **Relevance:**

Requirements OM-10.1, OM-10.2, and OM-10.3 (up to 11 points)

- **Example: Arizona DOT (ADOT)**

➤ Has a RMP consisting of multiple systems, Standard Operating Procedures (SOP), and documents that cover the core assets including pavement.





INVEST - New Opportunities



Technical Assistance and Available Resources and INVEST Round 3



- Training Workshops – materials and support
- Scoring Workshops – on-site assistance
- Peer-to-Peer Contacts – learn from user experiences
- INVEST Round 3 – funding opportunity and webinars
- FHWA Sustainable Highways Initiative
<https://www.sustainablehighways.dot.gov/default.aspx>

Evaluate, Score, Improve!

Some things to keep in mind . . .



1. Use INVEST to identify goals, set priorities, track progress, and share successes
2. Collaborate to Evaluate – build a team
3. Don't over-emphasize the score – learning about sustainability improvements is more important!
4. Improve - projects, programs, practices, policies



Try INVEST at:
www.sustainablehighways.org

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Report Overview

Sustainability Action Areas

Sustainable
Pavements

Safety

Linking Asset
Management
and Planning

Road Weather
Management

Freight and
Goods
Movement

Economic and
Life Cycle Cost
Analysis

Access and
Affordability

FHWA Initiatives

- Sustainable Highways
- INVEST
- Sustainability Working Group



Thank You!





APPENDIX



Appendix: Time Required



- Easy to use, not time intensive, can do in-house, or hire contractor
- Time required varies, but plan on the following:

Activity	Time
Point person browses tool	8 hours
Point person identifies and contacts staff subject matter experts (SMEs) for each criterion	16 hours
SMEs review criteria, gather documentation, develop initial scoring recommendation	2-3 hours per SME. With 10 SMEs that would be 20-30 hours.
Hold scoring workshop – 15 staff in full day workshop	15 x 8 = 120 hours
Point person writes up the recommendations	8 hours
Staff analyze pros and cons of recommendations; management decides to implement or not	Varies
Implement recommendations	Varies
Re-score	8 hours
Document and share successes	8 hours
Total	190 staff hours, plus time to analyze and implement recommendations

Appendix: Time Required



- Time and Labor Spent on PD Module:

Agency	Project	INVEST Users	Workshop Time	Individual Time
Cape Cod Commission	Hyannis Access Study	Seven staff on interdisciplinary team	Full day	Three to four staff spending half days for a week
District of Columbia DOT	Retrospective evaluation of a project	Project Development and Environmental Office Team	No workshop	Several days for data collection; collectively scored the project, which took approximately four hours.
Washington State DOT	Retrospective evaluation of SR 520 Project	22-person interdisciplinary scoring team including staff and contractors	No workshop	Each scorer spent approximately one hour for initial responses, with minor additional time for follow-up questions





Appendix: Time Required

- Time and Labor Spent on SP Module:

Agency	Plan	INVEST Users	Workshop Time	Individual Time
Cape Cod Commission	2012 Regional Transportation Plan	Eight staff on interdisciplinary team	Full day	Three to four staff spending half days for a week
Kittery Area Comprehensive Transportation System	2010 Long Range Transportation Plan (LRTP) and 2014 LRTP	Review Committee with representation from local municipalities, advocacy groups, Maine DOT, and FHWA	6 hour workshop	Plans were scored as a group at the workshop, instead of individually. In advance of workshop committee members allocated a couple of hours each to familiarize themselves with the tool.
Puget Sound Regional Council (PSRC)	Transportation 2040 Update	11 staff within long-range transportation planning team	No workshop	Equivalent of having three full time staff over the course of three to four days
Washington State DOT	Corridor Studies	Nine staff on interdisciplinary scoring team assisted by 28 subject matter experts (internal and external)	Full day	Individuals spent several hours each filling out a pre-workshop score sheet for each criterion and consulting subject matter experts





Appendix: Achievement Levels for SP

System Planning for Regions and States Achievement Levels





Achievement level		Fraction of Total Points Possible	Points Required
	Platinum	60%	144
	Gold	50%	120
	Silver	40%	96
	Bronze	30%	72

The points possible do not include points for the bonus criterion, SP-4

Appendix: Achievement Levels for PD

Project Development Achievement Levels								
Achievement level		Fraction of Total Points Possible	Points Required					
			Paving	Urban Basic	Urban Extended	Rural Basic	Rural Extended	Scenic and Recreational
No. of Available Points			63	136	171	119	153	136
	Platinum	60%	38	82	103	71	92	82
	Gold	50%	32	68	86	60	77	68
	Silver	40%	25	54	69	48	61	54
	Bronze	30%	19	41	52	36	46	41

Appendix: Achievement Levels for OM

Operations & Maintenance Achievement Levels			
Achievement level		Fraction of Total Points Possible	Points Required
	Platinum	60%	126
	Gold	50%	105
	Silver	40%	84
	Bronze	30%	63